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TECHNICAL AMERICA

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THE STREAMLINED TRAIN

THE EVOLUTION OF THE MOLECULE
Professor Albert Sprague Coolidge

SCIENTISTS AND SOCIETY

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FROM THE EDITOR'S DESK

Announcing A Contest

There has been hot controversy among the editors of this journal. A strong faction holds that when the magazine leaves our desk it passes from the sight of man. Another smaller, but more vociferous group, maintains that there are here and there a select and knowing few who read TECHNICAL AMERICA.

In an effort to restore harmony to the editorial board we are instituting a contest.

Readers are invited to submit letters of 300 words or less on the subject of (a) Why I Read TECHNICAL AMERICA, (b) Why I Do Not Read TECHNICAL AMERICA. To the author of the best letter received there will be awarded a copy of "You Have Seen Their Faces" by Erskine Caldwell and Margaret Burke-White. To the writer of the best letter disagreeing with the winner there will be awarded a copy of "Rich Land, Poor Land" by Stuart Chase. Letters must be in before February 1, 1938.

The Scientific Worker

The organization of scientific workers presents special problems. The employer likes to use his scientists as an example to other workers to demonstrate that service and loyalty make for harmonious relationships. The ego of the scientist may be inflated, and he is likely to become a tool of the employer in his struggle to keep the wages of the workmen as low as possible.

In the miniature world created for the scientist, however, certain problems arise which tend to bring him back to reality. He discovers that his freedom of investigation is restricted; his employer claims patent rights to all his discoveries; he must observe secrecy in his work where openness would not only avoid duplication and waste, but would result in cooperation with a resulting increase in the tempo of scientific progress.

The scientist is then forced to turn to the problems of the outside world in order to better understand his own. He discovers that the same forces which are restricting him and frustrating science generally are the forces violently opposed to labor. In order to defend science from its enemies he finds sooner or later that he must organize, and look to labor as an ally. The FAECT, the CIO union for technical and scientific workers, is the best possible vehicle for him. In it he will find a hearty welcome, and through it he will meet scientists of all fields who are of a mind with his own. Together with them he has a chance to perform his mission, which is the service of humanity through science.

HAROLD WILKES

An Important Request

I am enclosing one dollar for a subscription to TECHNICAL AMERICA. Please send the magazine to the library of the College of Engineering, New York University.

I feel that it is of utmost importance that every engineering college library have this publication available for its students. I suggest that every reader of TECHNICAL AMERICA send to his Alma Mater a similar subscription.

S. G.
NYU, '35

John L. Lewis Likes It

Mr. Lewis has asked me to thank you for your letter of December 4th. He asked me to tell you that he thinks your new publication "Technical America" looks very attractive, and wishes the greatest of success for it.

With all good wishes,

RALPH HETZEL, JR.,
Secretary to the Chairman

From Chicago

Chicago, Ill.

I have read your publication for the last few years, and I think your December issue a vast improvement over the earlier issues of our national publication.

Not only has the organizational material proved more interesting, but the technical material as well has been ably presented, and I know that continuing along these lines will be of interest to our fellow technical men whom we have as yet not reached.

WILLIAM JENSEN

Season's Greetings

The Federation of Architects, Engineers, Chemists and Technicians, and its National Executive Council, together with the editorial board of TECHNICAL AMERICA, extends the season's greeting to all its friends.

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The 'Streamlined Train'

The Streamlined Train Is Good Streamlined Publicity

Actually, It Is The Old Locomotive All Dressed Up

THOMAS JACKSON

WHAT with stream lined fountain pens, shaving brushes, cuspidors, ash-cans, crutches, etc., on the market, and the public suffering acutely from stream line mania, it seems rather skunky to credit stream lining with being no more than an advertising line. A moments reflection, however, will show the reader that such is indeed the case for all moving objects whose frontal area is only a small proportion of their surface area.

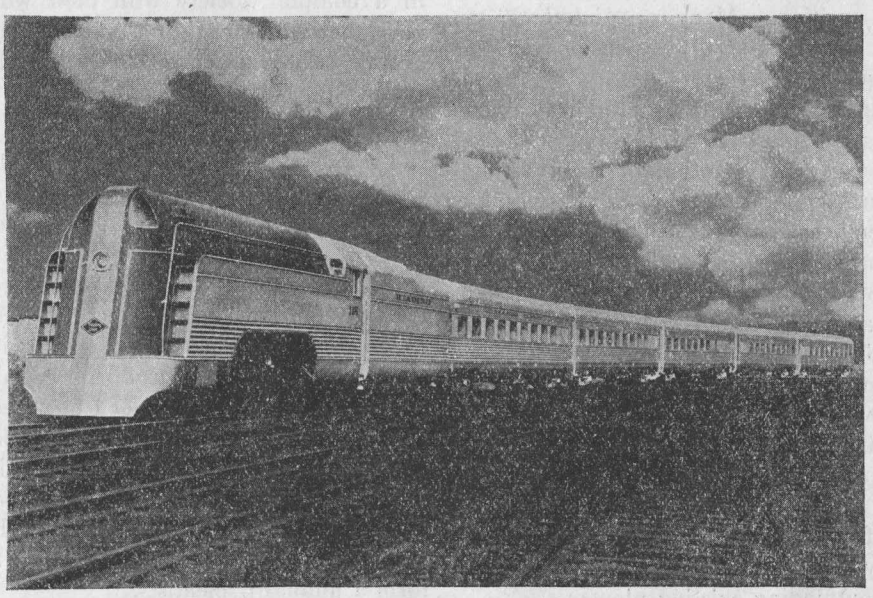
In the case of an aeroplane, stream lining is of course, vital. In the case of the Reading train, well, the Reading Company has to meet the Pennsy competition, somehow, and the public *demands* stream lining. It *sounds* speedier, anyway. The motive power is supplied by the good old steam locomotive, carefully hidden under a "stream line" tin can of stainless steel designed by Paul Cret, noted stream liner of Phila. buildings. A careful inspection of the news pictures will, I believe, show the connecting rods coyly hiding beneath their stainless petticoat. The advantages of jacketing the locomotive are doubtful, although the added weight of the unnecessary jacket will give greater (though unnecessary) tractive power.

The advantages would include speedy appearance and elimination of smoke from the engineer's view. The disadvantages are that the engineer cannot easily detect any boiler defects, the cost of dismantling and reassembling when the engine is undergoing repairs, and also the fact that the added weight will probably help to shake down the bridges and road bed between New York and Philadelphia. For resistance to buckling by heat was the factor which forced the designer to place a thick heavy jacket on the locomotive. Elsewhere, throughout the train, the high tensile strength of the stainless steel of which the train is built, made extreme lightness possible, for stainless steel has an ultimate S of 180,000 lbs. per square inch.

The train, excepting of course, the locomotive, — which was built several years ago for Reading Co. — was designed and built by E. G. Budd Co., auto body makers of Philadelphia. The train was made of stainless steel plates, most of them corrugated stampings for additional strength, pressed and assembled, similar to automobile bodies, by the most famous shot-weld process.

Shot-welding, as spot-welding, has been in use for years in auto body construction. The new spot welding machines automatically control the length and strength of the "shot" of electric current through the two parts being welded together, thus insuring a more perfect weld without depending upon the skill of the operator. This naturally eliminates the skilled operator. The shot welding machines are equipped with a pistol like handle and trigger, and the underpaid piece worker can imagine himself hunting big game, as he shoots his way toward 5 p.m. If he gets too enthusiastic, his rates are cut.

(*Continued on Page* 19)



Above—The Reading Railroad Streamlined Train.
Front Page—Budd worker placing a shot-weld in a train's side wall.

Scientists and Society

A Scientists' Division in Federation

UNTIL near the end of the nineteenth century Science was not recognized as a profession. The founders of the scientific basis of modern civilization were mostly university teachers or physicians who in general, had the attitude that their research work was apart from and above the general struggles of society.

With the development of our technical civilization, the number of people engaged in scientific work has increased enormously. The social importance of their work has grown and the position of scientific workers has suffered a radical change. Scientists are active in large and small groups in many industries, in public service, in museums, hospitals and research institutes, and, of course, in universities. The technical control of and the advance of methods of production in industry and agriculture depends upon their work, as does the progress of medical science.

Hired and Fired

The position of scientific workers today is little different from and no better than that of many other wage-earning or salaried groups. In industry, men of scientific training are hired and fired in the same way as men with any other training. In scientific institutions, the workers often have a high nominal status as "fellow" or "professor", which is usually balanced by great insecurity of position. Many appointments are for a year or less, and pension arrangements are very rare.

In general, the remuneration of scientists is quite out of keeping with the expense and duration of their professional training. There is considerable unemployment among them and their situation is affected by the ups and downs of the business cycle, as is that of any other group.

But scientists have very special concerns at the present time. Most important is the increasing misapplication of their work. More and more they see the results of their researches diverted to the destructive purposes of war, while useful discoveries are frozen because they might diminish corporation profits by outmoding existing plants.

They see current a sinister revolt against reason and the scientific method at a time when scientific thinking is most urgently needed to solve the problems of the world.

A Scientists Division is being set up in the Federation. Its main objects are to promote the interests of all scientific workers and to secure the wider applications of science and scientific method for the welfare of society. It will be an organization of qualified scientific men and women capable of defending their own interests and of ensuring that scientific research is adequately financed, intelligently organized and directed primarily to the improvement of the conditions of life.

The time has come when scientific workers must move to protect themselves and the whole of society. They must consider how best to defend and advance the application to social problems of the scientific method for which they stand, the method of reason based on valid evidence. They must realize that the only way to achieve these ends is by united, organized action.

Some sort of professional association or union of scientists is necessary. Further, it must be recognized that, though scientists are a large and important group, they are only one of the factors in a complex society with their work and activity linked to many other groups, so that to attempt to act in isolation would be an unpractical policy.

Rational Science

The labor movement itself is most interested in the rational application of science. Part of the present day reaction from reason consists in pseudo-scientific attacks on the labor movement, progressive politics, and democracy. An organization of scientists speaking with the authority of their profession would be able to expose the fallacies of these attacks. In thus defending and expounding their own position, they would make themselves very welcome to the labor movement. It appears, then, that the most practical program would be to form a union of scientists.

There already exists a virile and successful national organization of technical workers, the Federation of Architects, Engineers, Chemists, and Technicians (FAECT), which is affiliated with the most active section of the labor movement, the Committee for Industrial Organization. The Federation is the logical organization to which a group of scientists should affiliate.

Organization with the FAECT is particularly indicated by the fact that the Federation has already organized large numbers of chemists and other technical workers in industry. It should be remembered that no hard and fast line can be drawn between members of a scientists group and technical people. Many of the latter can be classified as scientists, and there is a continual shifting back and forth between industrial and institutional positions. Institutional workers thus provide a reserve of technical labor for industry. The proper organizational form within the FAECT would be a "Scientists' Division."

Common Problems

This division would have many problems in common with the rest of the organization. But it would also have certain special problems. For instance, in many cases institutions in which scientists work are supported by charity or public funds. With a strong organization they could bring pressure on state and national bodies to provide adequate funds.

The scientists division would be faced with special problems of publicity, since public interest in science tends to direct publicity toward scientists. Also, part of their struggle to maintain and improve their status would have to consist in public exposition of the scientific method of approach to many social questions.

A group of scientists from research institutions, museums, industries, and universities in Philadelphia has met and considered these points. They have joined the local chapter of the FAECT and have arranged to meet regularly as a group. Methods for building up a Scientists Division will be considered; also a program of activity.

Meanwhile, they would be glad to hear of the organization of similar groups in other parts of the country and would welcome suggestions and enquiries. Letters to the Philadelphia group should be addressed to the FAECT (Scientists Group) 1827 Arch Street, Philadelphia, Pa.

The Evolution of the Molecule

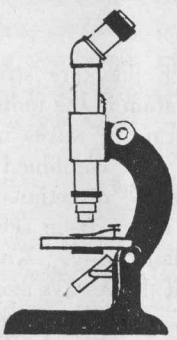
PROF. ALBERT SPRAGUE COOLIDGE
Harvard University

IT IS, of course, not the actual physical molecule (whatever these words may mean), but man's ideas about the molecule, which have been evolving. As physicists have studied the behavior of different kinds of matter, and chemists have worked out the laws of transformation of one kind of matter into others, the picture of the molecule has grown in sharpness and completeness from the exceedingly vague imaginings of the ancients to one which, in spite of its minuteness, can be specified with astonishing detail and precision. Strangely enough, however, the present trend is in a sense a reversal of this process; according to current ideas there is inherent in Nature a certain coarseness of grain which sets a strict limit to the possible refinement of observation, and it is generally considered to be futile or worse to indulge in speculations which cannot, even in principle, be controlled by experiment.

Since the most ancient times, philosophers have been attracted by the notion that matter is not indefinitely divisible, but is built up of permanent particles or atoms (Greek for uncuttable) too small for human perception. However, their naive conceptions were based on metaphysical arguments or esthetic preferences and were of no scientific value.

The first real evidence in support of the atomic hypothesis was marshalled by Dalton in the early years of the nineteenth century, and consisted in the demonstration that when elementary substances unite to form a chemical compound the proportions (by weight) are always the same, and furthermore bear simple ratios to the proportions which enter into the formation of other compounds. This Dalton explained by assuming that each element contains a definite species of atom, to which it owes its properties, and that chemical combination consists of a matching off in pairs (or more complex groups) of the atoms of different elements, forming compound atoms which, because of the closeness of the union, have entirely new properties.

Dalton's compound atoms gave the first insight into the nature of the distinction between what are now known as atoms and molecules, but he was prevented from perceiving the whole truth by his belief that in elementary substances the atoms have a free and independent existence, in contrast to their condition of intimate partnership in compounds. This matter was soon cleared up by Avogadro. As a result of his studies of the relations between the volumes of gaseous elements and compounds, he concluded that the condition of intimate partnership is a general one, existing as well in elements as in compounds; he was thus able to give a clear and serviceable definition of a molecule as a "little pile" of atoms which acts as a permanent and independent unit.



If the pile contains atoms of different kinds, the molecule is that of a compound; if there is but one kind of atom, or as a special case a single atom, we have an elementary substance. Thus the molecules of argon consist of a single argon atom, those of oxygen contain two oxygen atoms, while the ozone molecule has three oxygen atoms and produces a substance having very different properties from ordinary oxygen, although both are the same element.

The permanence and independence of the molecules are, of course, only relative, and are most perfectly realized in the chemically stable gases studied by Avogadro. When such a gas is cooled or compressed so as to bring the molecules into close contact they lose their independence and cling together forming a liquid or a solid crystal; in some cases this process goes so far as to obliterate every trace of the special intimacy which formerly existed between the atoms of a particular gas molecule. When heat is applied or the pressure released, the independent condition of the molecules is again established. But if the gas is made to undergo a chemical change the molecules are broken down and their constituent atoms rearranged into new combinations.

It is rather astonishing to realize how far molecular theory was able to develop without any hint as to the actual size and number of the molecules. Their relative numbers in different substances were fixed from the beginning by Avogadro, who enunciated the theory that in such samples of any two gases as fill the same volume, under similar conditions of temperature and pressure, there are contained the same numbers of molecules. This was the starting point for the triumphant Kinetic Theory of gases, which in the hands of the masters Maxwell and Poltzmann showed that the common physical properties of gases are exactly those which must be shown, on the average, by a swarm of particles in ceaseless chaotic motion. Thus, the pressure which every gas exerts on the walls of its confining vessel is simply the net effect of the impacts of the colliding molecules; if the energy of a single collision could be determined it would be easy to find the number of collisions required to produce the observed pressure, and hence the number of molecules present.

Now, the analysis of the Kinetic Theory showed that the average energy of the chaotic or thermal motion of all particles is the same, irrespective of their size or weight, and depends only upon the temperature. Energy, however, is the product of mass with the square of velocity, so that with particles large enough to be perceived individually the velocity corresponding to the average chaotic motion is too small for detection.

The first bridge across the chasm between the theoretical region of imperceptible masses and the practical region of imperceptible thermal motion was constructed in 1908 by Perrin. He found it possible to prepare particles of gamboge large enough to be counted and measured under the microscope, yet small enough so that when stirred into water and then left alone they did not settle to the bottom, but remained per-

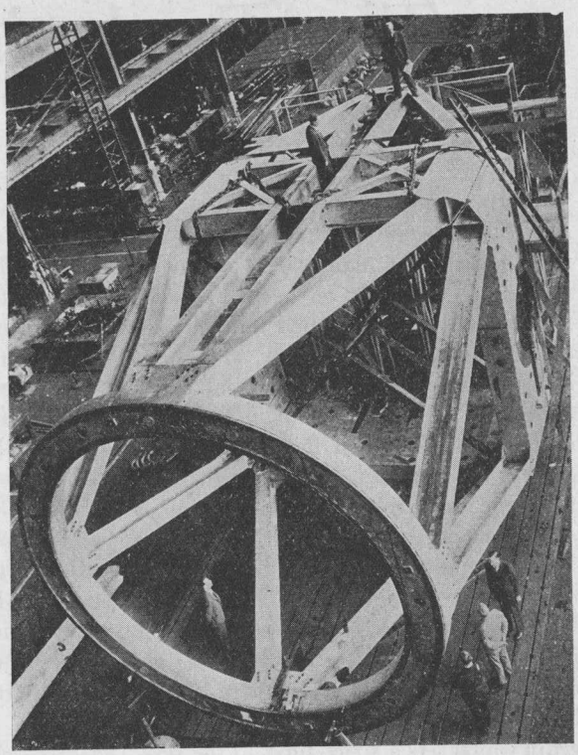
(Continued on Next Page)

manently suspended at various heights, the numbers decreasing from layer to layer according to the same law which governs the density of the earth's atmosphere at increasing altitudes, though of course on an infinitely smaller scale. Now, it is nothing but thermal motion which keeps both air molecules and gamboge particles afloat. Since Perrin knew the weight of his individual particles he could calculate the energy required to keep them at the observed height, and thus he determined the missing quantity required for the calculation of the actual number of molecules in a gas. Since then, other more accurate methods have been found, which have confirmed his results within a few percent. In 32 grams of oxygen gas (the quantity taken as a unit for chemical purposes) there are 6.06×10^{23} molecules (six times one followed by twenty-three zeros).

This number is appropriately known as Avogadro's number. Once known, it permits other properties of molecules to be found in rapid succession. Thus, several effects in gases, such as viscosity and conduction of heat, are shown by kinetic theory to depend on the frequency with which molecules collide with each other in their chaotic motion. This of course depends upon their size as well as upon their numbers and velocities. The last two being known, the size can be found at once. The molecules of the common gases have dimensions of the order of half a millionth of a millimeter. A study of the electrical properties of gases shows that certain molecules have a tendency to turn in an electric field in the same way that a compass follows the field of a magnet held near it. These (the so-called dipole molecules) evidently have an unsymmetrical structure, leading to a lopsided arrangement of electric charges.

Magnetic properties of single molecules have been investigated by allowing them to stream from a reservoir of gas through a very fine hole into a vacuum maintained by powerful pumps. In these experiments the disturbances due to collisions are eliminated and the paths of the molecules can be followed, with particular reference to the manner in which they are deflected when electric and magnetic fields are applied.

Recently valuable information about the structure of molecules has been secured with the aid of X-rays. When a beam of these rays is passed through a gas or liquid there are certain directions in which they are strongly scattering. Each atom in the molecule sends out its own train of waves in every direction, but the combined result is strongest in those directions where the crests of the waves from several atoms arrive simultaneously. Knowing the wave-length of the X-rays and observing the angles of maximum scattering, we can calculate the distances between adjacent atoms in the molecule.



Scientific analysis of metal reached a new high in fabrication of the Mt. Palomar telescope where each shot-weld connection was X-rayed and annealed to guarantee perfect performance.

The most spectacular advance in our knowledge about molecules has come since the advent of the quantum theory, which for the first time makes possible a reading of the riddle propounded by the beautiful spectra which molecular substances emit in flames and electrical discharges. Under powerful spectroscopes these spectra are revealed as composed of thousands of bright lines arranged in well-defined patterns. The quantum theory gives definite predictions as to the patterns which should be produced by various types of motion: thus, a vibratory motion such as would be performed by two weights connected together by a spiral spring should give a pattern of lines equally spaced, the spacing increasing with the stiffness of the spring, while a rotary motion should give lines separated by rapidly increasing intervals. By identifying such systems of lines in the spectrum of a molecule, it is possible to get very accurate information about the positions of the constituent atoms and the way in which they are bound together.

Meanwhile, of course, our ideas about the atoms themselves have been continually evolving. In place of the simple indivisible particles of the early speculators we envisage complicated assemblies of far smaller particles held together by electrical forces. The law followed by these electrical forces is assumed to be the same inverse square law as is well known from experiments on the laboratory scale.

In the case of the simplest molecule with two atoms, hydrogen, it has been possible to show mathematically that the combined effects of these electrical forces between the different parts of the two atoms are equivalent to a spring holding the atoms together, and that the stiffness of this spring is exactly the same as that deduced from the lines in the spectrum. In this case we have a complete "explanation"; that is, we have shown that the formation of exactly the kind of molecule as actually observed is a necessary consequence of familiar facts. No doubt the result is general, and we may safely say that the once mysterious thing, chemical affinity, is of purely electrical origin.

2 Million More To Lose Jobs

According to the WPA, two million have lost their jobs since September. Between 1 and 2 million more will join them by February 1.

Architect Turns Engineer

Frank Lloyd Wright Does Some Pioneering In Reinforced Concrete Design For The Johnson Wax Works At Racine

REPORTS keep coming out of the Middle West about an unusual concrete building under construction for the Johnson Wax Works at Racine, Wisconsin. The architect, an old friend of the Federation and one of the Contributing Editors to TECHNICAL AMERICA, is Frank Lloyd Wright. Wright has for so long been known as an innovator in architecture that he has become some kind of myth to some of us. It comes as a refreshing surprise, therefore, to learn that he is still actively experimenting and developing new ideas.

In this stage of industrialized construction and precise building technique, we naturally think that engineering developments are the special field of the engineering designer, and to a great degree, of course, that is true. But there occasionally appear men who seem to have an instinctive feel for the logic of good engineering design even though they themselves have not been trained in the actual formulas and text book rules of that science. It is certainly too early to predict the practical values of Wright's novel construction at Racine; but it can safely be said that he carries on the tradition of the master builders of history, who designed and built out of their own experience and judgment.

The Johnson Building, bounded by three streets, is surrounded by architecturally undistinguished frame shacks and small stores. Because of this Wright has the structure "turn its back" on it all and his three street elevations are blank walls except for illuminating strips of glass. The only entrance is on the fourth or interior side of the plot. The main element is the large work room 130x10 ft. in plan and 210 ft. high, housing several hundred office employees. Around the room is a mezzanine gallery on which are located the executive offices. The interior entrance which the architect calls a "carport" is bordered by a one-story garage.

The exterior and interior walls, with the exception of office partitions, are of special brick, 3x9x2½ in., light red in color. The bricks are molded in both convex and concave shapes to conform to the numerous curved surfaces in the walls. The main walls are brick veneer on both sides, with a 3-in. core of cork. The two spaces between brick and cork are filled with reinforced concrete. Up to the mezzanine level the walls are 15 in. thick; above the level they are 11½ in. thick.

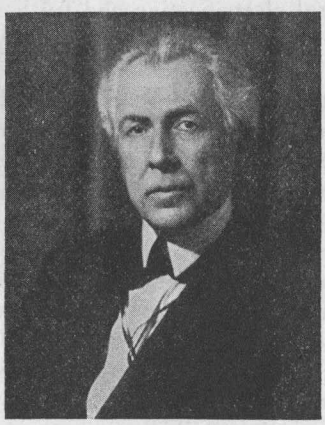
Natural light is provided by the strips of glass tubing which encircle the "blind walls." The glass strips will also house some of the artificial lighting equipment. All artificial illumination has been so arranged as to appear as if it came from the same source as the natural light. The heating system is in the nature of an innovation, the main building floor acting as a radiator with steam pipes placed under the floor slab. Air conditioning will prevail throughout the year.

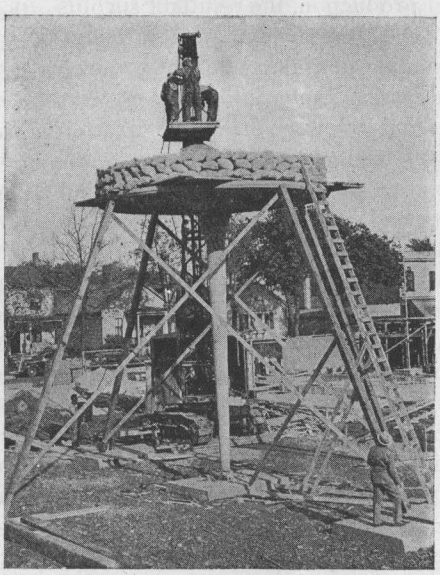
Engineering interest centers around the design of the concrete columns which are spread 20 ft. center to center in both directions. These are slender tapering shafts 9 inches at the lower tip and widening out gradually as they rise to a hollow slab cap 18½ feet in diameter. The tallest columns in the lobby area are 31 ft. high. The "carport" columns are 8½ ft. high. Wall thicknesses of the columns vary from 3½ inches to 5 inches. The petal, or cap, 18½ ft. in diameter, is made of a sloping bottom slab 2½ in. thick, above which are 4 concentric concrete rings. In addition to the circular rings the petals carry four radial ribs 10½ inches wide. The ribs have continuous top steel extending from one petal core to the core of the adjacent petal. The only reinforcing in the petal slabs and the column stems is no. 10 expanded metal lath. Although Wright did not design this unique column and floor system analytically, his feeling for the correct proportions and dimensions seems to have been corroborated by laboratory loading tests.

Because of the manner in which Wright works, construction is proceeding very slowly on the Johnson Building. The contractor started work over a year ago with only the preliminary plans, and many of the details are worked out as they are reached and many changes made as construction progresses. Fortunately the owner, who is interested in Wright's ideas, is in no hurry. Indeed he is reported to be taking great pleasure in watching his architect's theories take shape.

The Johnson Building is certain to be much talked about when it is finished. In due time TECHNICAL AMERICA will bring to its readers an analysis of this latest of Frank Lloyd Wright's designs.

Right — The mushroom concrete column. The "carport" has a petal and cap. *Below*—Frank Lloyd Wright.





This Column Holds 60 Tons

Technology and Farming

ALEXANDER KUHNEL

(The following is the fourth of a series of articles based on the Report on Technological Trends and National Policy of President Roosevelt's National Resources Committee. These articles are prepared by members of our editorial staff, and do not necessarily reflect the views of the Committee. The next of the series will appear in the February issue).

THE application of science and technology to agriculture has not advanced at so rapid a rate as it has in other fields. So far, indeed, has agriculture lagged behind industry in the adaptation of new discoveries to its own peculiar needs that it remains today appallingly inefficient and disorganized. The consequent toll in waste, taken in the form of needlessly expended effort and energy and of uneconomical dissipation of nature's resources, constitutes one of the major tragedies of our time.

Beyond the Farmer's Control

It would be entirely too simple a matter to place the blame wholly upon the farmer. It would also be grossly unjust. The fact is that conditions to a great extent beyond the individual farmer's control have decreed the anarchical development of American agriculture. The farmer can scarcely be blamed for the succession of wars which have created sudden, unprecedented demands for agricultural products, while at the same time draining the farms of much of their available manpower for military and other service. Nor can he be held accountable for the recurrent business depressions which have dumped literally millions of unemployed back on the farms at a time when there was least demand for their produce. Neither would it be just to hold the farmer responsible for the fact that science and industry found it more profitable, on the whole, to focus their attention elsewhere, leaving the farmer to manage with tools at best but poorly adapted to his requirements.

All things considered, the American farmer has done his best under trying conditions. Farm output per worker has, since 1850, increased at a pace with the output per worker in industry. From 1910 to 1930 it increased 41 percent, while industrial output during the same period increased 39 percent.

At the end of 1935 only 789,000, or 11.6 percent, of American farmers had electric power available other than individual farm lighting plants. This compares with 100 percent for Holland and 90 percent for Germany. The average consumption of central-station power per farm in 1935 varied from 558 k.w.h. in West Virginia to 11,799 k.w.h. in California. We learn that over 200 different uses of electricity on farms have been noted, yet few of them are generally applied. Rural electrification still has its most extensive application in the farm home.

Turning to farm mechanization in general, we find that the important and determining factor is the size of the farm unit. While in 1929 over 80 percent of all farm products were sold or exchanged for goods, on nearly 50 percent of the farms the value of the aggregate product was less than $1,000 per farm, and on over 50 percent the commercial product was valued at less than $1,000. This would indicate very definitely that the average farm unit remains the small, family size farm. While it is obvious that certain economies are inherent in large-scale farm operation, the advisability of rapid advance in this direction is a highly debatable point.

No Other Employment

Such a trend would involve the release of hundreds of thousands of farm workers, for whom other employment would not be easy to find. Should large-scale operation result in greatly increased production, the resultant surplus would be extremely demoralizing. Domestic consumption of farm produce cannot increase substantially, even with substantially lower prices or greater mass purchasing power, and the possibilities for the expansion of foreign markets are very remote. Large-scale production is by no means universally applicable, both for topographical reasons and because of the nature of the products themselves. Finally, due to the uncertainty of the market, the ravages of various pests, and the vagaries of weather and climate, investment in large-scale farm production becomes an extremely hazardous proposition.

By and large American agriculture is destined to continue for a long time to come to be carried on in the traditional manner, that is, on the basis of family size farm units.

Viewed from this standpoint, our mechanical farm equipment is woefully inadequate. The machines in general are far too costly, too large, too cumbersome and too intricate to be economically adaptable for use on the individual farm unit. A four-row corn planter becomes a "white elephant" on a farm which raises but 10 to 20 acres of corn. Similarly, the average farm tractor is indeed an expensive luxury when it stands idle 90 days in every 100. In general, farm machinery is so costly an item on the man-sized farm that the farmer puts himself permanently "in hock" and even risks bankruptcy when he tries to mechanize with available equipment.

Cooperative ownership of farm equipment such as threshers, wood-sawing rigs, sorghum plants, creameries, cheese factories, grain elevators and terracing machines has been practised rather extensively and may be extended within certain limits. Cooperative farm management associations are a new development from which a great deal may also be expected. Yet the most important need is the development of cheaper, smaller capacity machines, of machines with multiple application to increase their working or revenue producing time—in general, farm machines economically feasible on the man-sized farm unit. Such smaller units have been developed here and there, and, as in the case of tractors and combines, clearly demonstrate their high efficiency as compared with larger units of their kind.

There is considerable evidence to show that an actual reduction in the size of the individual farm unit, with emphasis on chemical fertilizers, higher grade livestock and more hardy and productive varieties of plants, results in appreciable economy and efficiency. These trends, coupled with a wide extension of rural electrification and further adaptation of electric power in the processes of farm production, improvement of transportation, processing and storage equipment, and last but by no means least, better and more economical farm construction and rural housing, offer a sane approach toward the solution of the technical problems of the farmer. And lest you forget, the farmer is the fundation of our economic structure. Prosperity for him is inevitably passed on to the nation. Poverty and ruination for the farmer makes national prosperity utterly impossible.

The Untypical Freshman Speaks

R. P. I.'s First Year Man Has It All Figured Out

His Goal Is $20,000 A Year; $5,000 Spells Failure

WILLIAM QUIRK

DIGNIFIED and conservative Rensselaer Polytechnic Institute at Troy, New York, succumbed to the craze that bedevils less staid higher institutions of learning, and has released statistics on the freshman class to indicate what sort of a chap its average first year man might be. These publicity blurbs for colleges are continually bobbing up in the daily papers. After reading one of them you are acquainted with the fact that Mr. Average Student prefers milk to beer or vice versa, that his favorite morning paper is the "Herald Tribune" and that he would rather watch a tennis match than a football game. Interesting perhaps but quite unnecessary. R.P.I. heretofore had eschewed that sort of publicity, relying instead on a sound, thorough training in engineering knowledge to speak for itself in its public relations. It comes as something of a shock then to see Tech kicking over the traces to follow the popular trend.

When the statistics on the present freshman class were analyzed, the typical freshman turned out to be a youth 18½ years of age, 5 feet 10 inches tall and weighing 152 pounds. The student who most closely approximates these specifications is an Elmer L. Ernst of Buffalo, an undergraduate in the civil engineering school. Young Ernst was of course interviewed on a wide variety of subjects and some of his replies make an interesting study if we are to consider him a prototype for R.P.I.'s class of '41. We certainly hope that the analogy stops at the physical characteristics and that he is no criterion for the ethical principles of his class-mates.

The Economist

Ernst was asked if the making of money was an end in itself or does he want to make money for what it will buy. Rensselaer's typical freshman's unabashed answer was, "Making it is an end in itself. You know, playing around in the stock market and making money and things like that." What sort of an economics course is now being given up there at Troy? Sounds as if they were reading from a pre-1929 text book.

On the all important subject of marriage Master Ernst is quite definite, dismissing the question with a curt "I don't plan to marry ever. I don't care much for the opposite sex."

To the question as to how much money he thinks he will be making when he is 30, his smug reply is rather amusing, "I should be making $20,000 a year. But, you see, I'll be going in my dad's company. There is a place waiting for me when I graduate. It will be an office job because I have been through the plant—been everything from drill boy up to manager of a department."

Nice work if you can get it, but we know that of the 1,700 or so undergraduates in that hill top school overlooking the Hudson, the greater majority will never attain that figure at 30, 40, 50 or 60 years of age. But then they don't all have fathers who own iron and steel works.

When Master Ernst was further asked how he would regard himself if he were making as little as $5,000 a year when he is 30, his sad reply was, "Well, if I'm making that little, I'd say I was little better than a failure—very mediocre."

Statistics and Wages

Statistics covering the results of a Survey of the Engineering Profession made in 1935 by the Federal Bureau of Labor Statistics at the request of the American Engineering Council show that the mean annual earnings of a man 30 years of age, holding a first degree in civil engineering, is $2,130 per annum, or less than 11 percent of the $20,000. And by comparison with the "failure figure" of $5,000 which you set for yourself, Mr. Ernst, the average or typical engineer of 30, with his B.S. in C.E. earns but a scant 43 percent of that income. We wonder if the Ernst Iron Works of Buffalo, N. Y., pays its structural engineers a salary of $5,000. Somehow we doubt it.

We have come to expect more serious thinking in late years from our college students than is evidenced in Rensselaer's typical freshman. What is the reason for the obvious absence of such serious thinking? Young Ernst is intelligent. His high school record averaged 90 percent. He was the winner in a countrywide essay contest and was on the editorial staff of his high school year book and paper. To the question, "Are grades important," Ernst's reply was:

"Sure they are." They are something to work for. And when you get all through and have them, it gives you a sense of satisfaction."

We think if college training could give a man a true sense of values, he would be gaining something that would give him greater satisfaction than high grades. Acquiring a technical education requires a lot of concentration, determination, and burning of the midnight oil, but technical subjects should not absorb all the student's time. He should be given an insight through social sciences and economics into the complexities of getting a precarious living in this world.

The Real Engineer

We wish R.P.I.'s typical freshman a successful career as a civil engineer, but we are not thinking in terms of $20,000 or even $5,000 salaries. We hope instead he acquires such abstractions as a sense of proportion, independence of thought, and a development of tolerance and consideration for others. With an intellectual awakening to such a code of behavior, we will not deem him a failure whether he be in a $20 a week job or a $20,000 a year position.

A. Redfield

"All I said was: 'Merry Christmas, Peace on Earth, Good Will to Men'."

The Housing Committee Reports

Construction Of Over Three Million Units Necessary In The Next Two Years

THE National Housing Committee, set up last June as an independent group to make a study of a long-term national program for improving housing conditions, headed by Robert L. Davison of the John B. Pierce Foundation, and Peter A. Stone of the Works Progress Administration, completed and submitted its report to President Roosevelt last month.

The findings of the committee in charge of the survey proper, headed by Mgr. John A. Ryan, of the National Catholic Welfare Council showed, above all, that an acute housing shortage for families paying less than $30 per month rent has developed since 1930—that the need for at least 2,000,000 dwelling units has grown rapidly in the last seven years.

Introducing its report, the committee stated:

"While industrial production as a whole is running over 90 percent of the annual average for the 1925-30 period, residential construction is only about 34 percent of the 1925-30 average.

"It is obvious, then, that one of the most vulnerable points in recovery is the failure to attain a volume of residential construction in proportion to the recovery in industry as a whole. Moreover, in view of the important part formerly held by residential construction, it is apparent that recovery in industry cannot be sustained unless residential construction once more assumes its proportionate share, or some other industry makes up the necessary volume."

The committee further disclosed that an average of 175,875 dwelling units per year were constructed during the last seven years. But of this total, only 29,195 units cost $3,000 or less, 56,456 units cost $3,000 to $5,000, while 90,224, 51.3 percent, cost $5,000 or more and was equivalent to that group paying $50 or more per month rent.

Yet the number of families paying $50 per month rent, or owning homes in that rental equivalent, has decreased. In 1937 the number of families paying $50 per month rent or more is about one third the number in that category in 1930. The committee, using the figures 485,574 housing units as a "normal" requirement, pointed out that 3,007,706 housing units would have to be built in the next two years to catch up in 1939 with the potential market. And at least 89 percent of this figure would have to be applied to the need for houses costing less than $3,000, i.e., for those families paying $30 per month or less.

However, another aspect of the housing situation, generally overlooked, crops up. For while it might be thought that the $30 per month group constitutes a very low bracket group, the committee reveals that the shortage has also been acute in the groups paying under $20 and under $10 per month rent, especially in the North Central areas and Southeast Central areas, the East North Central and Pacific regions.

The following extract helps summarize some of the findings:

"A study of the changes from 1933 to 1935, a period when national income increased by approximately 35 percent, shows that the group earning $3,000 or more increased in number by only 25 percent, while the lowest-income group, with incomes below $1,000, decreased. The greatest gains were in the groups ranging from $1,000 to $3,000 in annual incomes. Since an effective demand for construction either for ownership or for rental to the upper group is not growing as fast as the national income, it is likely that even should the national income again reach the proportions of 1929, the highest in our history, we will not have the same number of families in this upper group that we had in 1929; hence the effective demand for higher-priced construction will not be so great."

The CIO Program

For This Recession

To all National and International Unions
Local Industrial Unions
Industrial Councils
Field Staff

THE time has come when the American labor movement faces a new wave of unemployment among American workers.

One of the great principles for which labor in America stands is the right of every man and woman to have a job, to earn their living if they are willing to work. Upon this principle, it becomes the duty of American labor to face with courage and realism the fact that America is threatened today with unemployment more bitter than ever before in our history.

Even in the putative prosperity of the last year, millions of our people were out of work. And now in the past three months the great basic industries of our country have closed down their production, in some cases with greater rapidity than ever before.

The CIO, as the main body of American labor, accepts the duty of representing its people who are out of work. It takes the responsibility of presenting their case to the nation. It is a case that concerns every citizen. The economic nation cannot live in health unless the case of those without work is solved vigorously, intelligently — now.

Already a call has gone out to all CIO organizations urging the establishment of agencies to deal with unemployed members of our unions. When these committees are set up, the job has only begun. We will not stint our energies.

A citizen of the United States has a right to live. He has a right to work. If the corporations which control American industry in their management of industry's affairs fail to provide that work, then there must be some power somewhere in this land of ours, that will go over and above and beyond those corporations and their inadequate policies, and provide a job and insure the workers the right to live.

JOHN L. LEWIS

Labor Unity

AN examination of the respective proposals of the AFL and CIO shows which organization sincerely desires unity and which one is just as seriously opposed to it.

The CIO proposal would immediately bring the entire CIO into the AFL, where under due democratic processes the seven million combined members would solve all the attendant questions. A united labor movement would result. Compare this with the proposition that a few of the CIO unions return to the fold of the AFL and the majority be left out pending discussion on how best they can be made the subject of raids, and their membership broken up.

The CIO refused categorically to betray any of its affiliated unions. The AFL just as adamantly refused to make any concessions on this point. Further negotiations under these conditions could not be anything but harmful at the present time.

The interests of unity will best be served by the steps the CIO has taken to consolidate its organization. It goes forward to the organization of the remainder of America's unorganized. At the same time the various CIO unions through united action with the AFL locals and joint activity can make unity a fact in spite of the AFL top leadership.

We in the Federation can do our part by studying carefully the proposals of our recent organizational conference (printed on page 13 of this issue) and putting them into life.

'Tis well the conference was held near the opening of the new year. Our successes during the last year multiplied many times must be our goal. We go forward with the CIO to the organization of the majority of the nation's technicians.

Special Session

THE special session of Congress just ended has been marked by a nearly complete surrender to pressure from big business—and an equally complete breakdown of party discipline among the Democrats. The President, at the beginning of the session, presented a four-point program to Congress—a wage and hour bill, a farm relief bill, reorganization of the administrative branches of the federal government, and a bill setting up regional authorities to develop the resources of the country (the "seven TVAs" bill).

This program was conceived in a period of recovery, but it included elements even more vital in the depression we now seem to be entering. What has become of it?

House and Senate have each passed a farm bill, but the two bills are so different that reconciling them is still a long job. As for the rest—nothing has been heard of government reorganization; hearings are barely beginning on the regional authorities bills, with action already slated to cut the power-development meat out of them. The wage and hour bill has been sent back to committee, there to die a lingering death or, rumour has it, to emerge castrated by the amputation of the wage provisions.

At the very outset of the session Congress was subjected to a cloudburst of propaganda from the newspapers and business interests—all boiling down to the old story—if we can't do what we like we won't play. And the Democratic party organization was not strong enough to hold the weak sisters and the reactionaries in liberal's clothing in line. And it must be said that one reason for this falling away of Congressmen elected on progressive platforms is the failure of their progressive constituents to keep them in touch with the real sentiment of the country. Letters, telegrams, and resolutions addressed to Congressmen are of vital importance.

The forces at work in Congress became very clear in the closing days of the session with the publication of a manifesto, signed by reactionaries of both parties, calling for a repudiation of the New Deal and a free hand to the economic royalists. Visibly the Democratic caucus is breaking down and the old guard is joining with its natural allies, the Republicans.

There can be only one answer to this strategy from the liberals. The clear need is for an opposing coalition of all progressive elements in Congress around a program adapted to meet the needs of the unemployed, the underpaid, the ill-housed. Some political observers have seen in the President's conference of December 21 with a number of liberal Senators the beginnings of such a move.

The query at the head of these paragraphs is perhaps unduly cynical. At the end of the special session the battle lines are clearly drawn. The progressives in Congress know what they have to fight against, and we believe they are realizing how they will have to fight.

Prevailing Wage

THE "prevailing wage" clause as inserted into the recently passed amendment to the Federal Housing Act is the gratifying conclusion to a long fight on the part of the Federation to obtain prevailing wages on all government housing work.

From the very inception of the Federation, we have been active in the work of getting prevailing wages for technical men. We succeeded in this connection on WPA, and now we have extended this principle to housing work done by both private industry and the government in the housing field.

The Federation is now in the process of submitting briefs on prevailing wages to the various local and Federal authorities. We shall continue our efforts to see that the prevailing wage provisions of the Federal Housing Act are fully enforced.

All the Kings Horses

THE days of the absolute rule of King Henry are numbered. Told to cease and desist immediately from his ruthless anti-labor policies by a unanimous decision of the National Labor Relations Board, he was ordered to reinstate 29 fired union men with back pay, to give up control of the company dominated Ford Brotherhood, Inc. and to stop all efforts to prevent workers from joining the United Automobile Workers of America.

Thus Ford with all his beatings of union organizers, with all his highly efficient spy system, with all his high-pressured, streamlined anti-union propaganda is unable to stem the tide of organization.

The decision will go far to bringing the Ford Kingdom back into the United States. We hail this as an important step in the bringing of industrial democracy to this largest industrial unit in the world. Given freedom to organize there is no doubt in anybody's mind, particularly King or shall we say ex-King Henry's that the majority of the 80,000 employed there will soon be in the United Auto Workers Union.

FEDERATION ACTIVITIES

Pittsburgh

Following affiliation with the FAECT the drive to expand the Pittsburgh Chapter was started. We list a few of the achievements:

(1) Steel: Tackling the American Bridge Company first, a local has been organized. A. J. Yaeckel, one of the first national vice-presidents of the FAECT, is leading in the steel drive.

(2) Westinghouse: A drive has been launched in cooperation with Local 601 of the United Electrical, Radio and Machine Workers of America, at the East Pittsburgh plant. The December issue of the *Union Generator*, official organ of the industrial union local 601, heralds the chartering of the FAECT and urges all plant workers to cooperate in effecting 100% organization of this tremendous industrial plant.

STEEL CITY INDUSTRIAL COUNCIL — Max Aber, national vice-president, has been elected to the executive of the Steel City Industrial Council of the CIO unions, and is therefore in a most advantageous position to represent the FAECT and to secure the backing of all CIO unions.

Civil Service (city and county) is also enrolling dozens of new members for the FAECT.

Chicago

CHICAGO APPARATUS COMPANY — Hearings were completed before the National Labor Relations Board with every indication that we will be successful in winning reinstatement with full back pay and establishing our union as sole collective bargaining agent.

INTERNATIONAL HARVESTER — At the tractor plant of International Harvester an election is now in process to designate the Steel Workers' Organization Committee as sole collective bargaining agent. The hourly technical employees have been certified for voting, and the SWOC is a sure winner.

Agreements have been reached with the SWOC whereby all the technicians and office employees, whether working on an hourly or weekly basis, are to be eligible as members of the FAECT. We shall have the authority to negotiate all grievances and demands in collaboration with the SWOC.

STOCK YARDS — In the three leading packing house plants there are 1500 technical and office employees.

The drive of the Packinghouse Workers Organizing Committee is meeting with spectacular success. Cooperating with this organizing committee, the FAECT has already signed up some of the technical and office employees, and is concentrating at the moment in this field to organize the majority of the 1500 eligible.

Philadelphia

WESTINGHOUSE — The new Chapter in Westinghouse has published a special booklet dealing with the history, record and program of the Federation and its relation to the technical staff in Westinghouse.

GAS PLANT — The FAECT along with Philadelphia labor is looking forward to the carrying through of the mayor's proposal to operate the Gas Works by the municipality in special agreement with the United Mine Workers.

This plan calls for complete union operation, and will bring some 125 chemists and technical employees into the FAECT.

HOUSING — Philadelphia is securing 12 million dollars from the Federal government for housing. The CIO is backing this housing program and has assured the draftsmen that prevailing union rates of pay will be the policy on all housing work done.

SCIENTISTS — A Local of scientific workers is being chartered which will take in many of the scientists employed at such firms as RCA, General Electric, and other world renowned research laboratories. The scientists feel that they are part of the labor movement and are enrolling in the CIO.

New York

Following a vote of the membership, Chapter 1 of New York has been dissolved and in its place two new chapters chartered; Chapter 31 to cover the industrial field and Chapter 32, the WPA technical employees.

CHAPTER 31 — To meet the large wave of mass dismissals special committees on unemployment have been set up. Through the efforts of the FAECT, layoffs in Gibbs and Hill were somewhat alleviated through an additional week's notice with pay, given to the men.

CHAPTER 32 — The drive for the expansion of WPA has already resulted in the release of requisitions for nearly 200 additional jobs for technical men and women.

Along with the demand for the immediate expansion of WPA, plans are being laid for another campaign to establish weekly prevailing rates of pay.

Milwaukee

National Vice-president Walter Johnson recently visited Milwaukee to take up the situation in Allis-Chalmers. An election is scheduled by the National Labor Relations Board, and technical employees are to vote either for the CIO (Local 248 of the United Automobile Workers) or the Independent Association of Draftsmen and Engineers. Vice-president Johnson found that the technical employees of the plant were quite enthusiastic for the CIO. He also learned that many of those who originally signed up with the Independent Association have since learned of the FAECT and are glad to join.

Since we have had no Chapter in Milwaukee, the FAECT is urging the vote for the CIO, and later will arrange to have all of the technical men affiliate with the FAECT.

New Jersey

HUDSON COUNTY ORGANIZING COMMITTEE — The FAECT Organizing Committee in Hudson County has joined hands with the labor movement and progressives in halting the un-American anti-labor offensive of Mayor (I Am the Law) Hague.

The FAECT in Hudson County correctly points out that the real purpose of Mayor Hague's gangster-like tactics is exposed when it is realized that in Hudson County graduate engineers, draftsmen and chemists are employed for as little as $16 per week.

NEWARK — Chapter 19 in Newark is now concentrating on the Breeze Corp., manufacturers of aereonautical parts.

San Francisco

SAN FRANCISCO—The drive is on to organize the food chemists. Contracts in January and February are the objective.

The laboratory assistants are now geting 30 to 40 cents per hour, and chemists from $120 to $160 per month. Our scale calls for $100 to $125 for laboratory assistants, and a minimum of $150 per month for graduate chemists to a minimum of $200 for graduates with five years experience.

Boston

EASTERN GAS AND FUEL — The drive to unionize this important gas plant is progressing. In January the FAECT local representing a majority of the technical staff will negotiate a contract for union terms in colloboration with District 50 of the United Mine Workers of America. They have a union agreement covering the plant workers.

ALLIS CHALMERS — Following our agreement with the UERMWA the technical men signed up in that industrial union are transferring to the FAECT.

A new wage scale is being drawn up and will be presented by the FAECT along with similar demands for the Allis Chalmers plants in Pittsburgh and Milwaukee.

Dental Technicians

In line with the policy of the FAECT and the CIO to give active help in organizing miscellaneous technical groups, the FAECT chartered as Chapter 101, the Dental Technicians Equity of New York.

This chapter has been able to negotiate a number of union agreements with laboratories. They have established the practice of requiring the FAECT union label on all shipments of mechanical work done in laboratories.

Chapter 102 has now been chartered to take in the Associated Dental Technicians of Philadelphia.

The organized local union of dental technicians in Baltimore has also voted favorably for affiliation. In Boston, the organization known as the Boston Dental Technician Association are favorably disposed and will shortly vote upon the question of affiliation with the FAECT.

An Eastern conference is being called of all the groups to consider a national department to launch a nation-wide drive to unionize this field.

Special National Organizational Conference at Hotel New Yorker

PRESIDENT Lewis Alan Berne, opened on the seriousness of the current "recession."

CIO Aid

He pointed out that because of the generous support given us by the CIO to date, its recent decision to curtail subsidies for organizers has not necessitated any let up in our work.

Thank CIO

The Conference thanked the CIO and its Chairman, John L. Lewis for its invaluable aid and decided to enlist the support of the members in each locality through special committees of volunteer organizers to extend the organizational drive.

Reporter

Marcel Scherer, National Organizational Director, reported on the work since the recent National Convention.

"Recession"

The present "recession," the outstanding issue of the day, he said, has been traced to the efforts of big business reactionary groups to retard progress.

Profits Soar

Business has made tremendous profits this last year, it is in a position to maintain its staffs without curtailments. The reports of chapters show that many firms have enough contracts to keep them busy for a few years; this work has suddenly been curtailed for no other reason than to attack labor and Roosevelt's progressive program.

Halt Layoffs

The campaign against unemployment calls for the organization of special committees in every office to react to every threatened layoff in order to forestall it; where that is not possible, to insist upon the principle of an equal division of work.

The issue of unemployment is to be the concern of every member of the FAECT. Layoffs affect everybody when big business is able to compel the government to curtail its program of civic improvements and public works.

The FAECT joins with other unions to demand the expansion of WPA, an adequate housing program and work sponsored by the government to take up the slack of the "recession."

Drive to Organize

The FAECT proposes to meet the "sit-down" strike of reactionaries with a well-defined plan of concentration. At the moment this drive is to be especially concentrated in New York, Philadelphia, Pittsburgh and in Federal Civil Service.

Education

An important weapon in this campaign is education; teaching the technical men and women who is responsible for the "recession," answering the misrepresentations that appear daily in a press owned and controlled by big business.

Technical America

In speaking of our national publication. TECHNICAL AMERICA, Marcel Scherer said it is being published on a strict budget with every indication that it will be self-sustaining as soon as all members subscribe in accordance with the convention decision.

Housing

On housing the proposal of the CIO leaders that the government use the Social Security funds for an extensive low rental housing program was adopted. A special FAECT Housing Committee is to serve the CIO housing program.

Students

Student chapters have been organized in the past in a few cities. A special report outlined a detailed plan to educate the student as to the importance of trade unionism as a defense of professional standards.

For the Cause of Democracy

An honor roll of Federation members defending democratic institutions in Spain was read. The Conference voted to honor these members with their new 1938 membership books, subscriptions to Technical America and Federation pins. Salud!

* * *

The Conference registered the fact that our union, during the past few months, has grown considerably in size and stature. These experiences enable us now to extend our organization, to double our membership so that we can successfully halt layoffs and continue to win salary increases.

Covering The Labor Front

CIO-AFL Unity

OBVIOUSLY unwilling to effect CIO-AFL unity, the committee representing the AFL in negotiations of the last few weeks refused an offer by John L. Lewis to affiliate the 4 million members of the CIO to the American Federation of Labor. This offer was made by Lewis with the conditions that all the CIO unions be chartered by the AFL and that thereafter the problems between the individual unions of the CIO and the AFL be settled in conference.

The AFL committee countered with the proposal that only the ten international unions which originally formed the CIO be re-admitted, and the remaining 22 unions be denied admission until the differences could be settled in the future. There was no indication as to how long it would take to settle these differences, and from indications in the electrical and woodworking fields, it might take years. This proposal, therefore, was not one calculated to promote unity, but rather to split the CIO, and by leaving the 22 unions unattached would be a factor, towards weakening them.

It was on this basic difference that the unity conferences were terminated. The CIO demands that all be digested or none. In the words of Lewis at the special meeting of the Executive Committee of the CIO held December 21, his proposal was made so that the division in the ranks of labor should and could be settled "within the family of labor, and not outside." Green replied that he would not consider bringing this fight into the AFL, but would insist on keeping it outside, "where it is now."

The Committee for Industrial Organization takes the position that the door is wide open for a resumption of negotiations when and if the AFL, with full knowledge of the fundamental attitude of the CIO, has any specific proposal to offer.

The CIO Executive meeting decided to proceed with plans to extend and consolidate the CIO movement, establish state and city central industrial councils, and to look forward to the calling of a national constitutional convention. The activities of William Green and other AFL leaders in knifing the Wages and Hours Bill was characterized as a despicable betrayal of labor and the people of the United States. An active campaign by the CIO for wages and hours legislation in the next session of congress was planned, as well as a broadening of the campaign for adequate WPA jobs for the mounting army of unemployed.

Insurance Agents

INSURANCE companies, like banks, provide the steady stream of billions which flow through industry. The nickles, dimes and quarters of industrial insurance policy-holders help to swell the treasuries of corporate wealth of America. The life companies are supposed to be cooperatives—mutual associations. But their labor policies are the labor policies of Wall Street — not of the policy-holders.

The vast majority of industrial insurance policy-holders of which there are some 87 million, are wage-earners and self-employed people. Insecurity, fear of unemployment, uncertainty of the future, all these dark shadows which hang over the lives of so many millions of American impel them to seek life insurance protection.

A decent American standard of living is the aim of all people who work. Protection against the hazards of life demands such a standard. This standard of living, to be maintained and improved is inseparably bound up with strong organization of labor, be it industrial, white collar or professional. What any group of workers achieve in improved salary standards and working conditions redounds to the benefit of all.

The FAECT urges its members to buy insurance from agents who are union members, to ask their agents to show a union card, and to insist that their insurance company recognize the Industrial Insurance Agents Union of the United Office and Professional Workers of America.

Unemployment

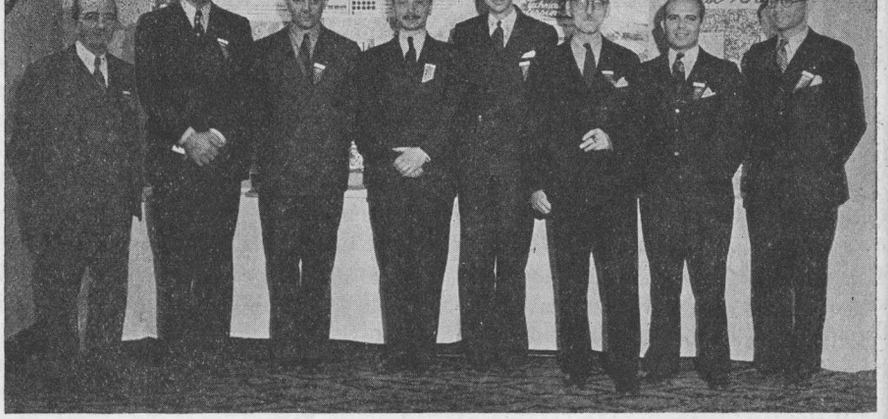
Aiming at insurance of another kind, the CIO is moving quickly to win government protection and relief for the hundreds of thousands of workers who have been made idle in recent months.

In answer to Professor Lewis H. Haney, of New York University, who told the National Industrial Council of the National Manufacturers' Association that "the idea that the laborer has a right to his job is a vicious notion," John L. Lewis said:

"One of the great principles for which labor in America stands is the right of every man and woman to have a job, to earn their living, if they are willing to work.

"A citizen of the United States has a right to live. He has a right to work.

"If the corporations which control



National Officers of the FAECT elected at the Third National Convention. Left to right—Walter E. Johnson, Guy K. Young, Marcel Scherer, Lewis A. Berne, Robert M. Sentman, James A. Gaynor, John Vasta, Borice Z. Borise.

American industry in their management of industry's affairs fail to provide that work, then there must be some power somewhere in this land of ours, that will go over and above and beyond those corporations and their inadequate policies, and provide a job and insure the workers the right to live."

The United Rubber Workers has already developed a four-point program of organized effort to secure adequate relief funds from state legislatures; expansion of Federal relief and WPA programs; support of a large scale Federal housing program, and the setting up of local committees to act directly in behalf of the unemployed.

Seattle city officials have granted the unions the right to certify jobless members for immediate work relief.

In Pittsburgh, the convention of the Steel Workers Organizing Committee passed a resolution calling on Congress for appropriation of one billion dollars to continue WPA and insure a job for every worker. A second resolution called for a gigantic, five billion dollar housing program to be carried through by the Federal government.

Steel Convention

Pouring into Pittsburgh from every section of the country, 1,000 delegates met last month for the first annual convention of the Steel Workers Organizing Committee.

Less than 18 months after the SWOC started to enroll the men of steel into the ranks of the CIO, the delegates were able to look back at a record of accomplishments which includes 445 contracts covering approximately 550,000 workers. The contracts have all been signed since March 2 of this year, when the SWOC reached its history-making agreement with the Carnegie-Illinois Steel Corp., subsidiary of U. S. Steel.

In his report opening the convention, Philip Murray, chairman of the SWOC, stressed the need for a detailed survey by the Federal government of diminishing work opportunities in specific industries; a recommendation that the SWOC provide protection for jobless members, and establish an employment committee in each lodge for handling of this problem; cooperation with Labor's Non-Partisan League and the pushing of the legislative program adopted at the Atlantic City convention of the CIO.

A resolution concurring with "labor and liberal organizations throughout the world" in a boycott of Japanese goods was adopted amid cheers and applause. The Japanese attack on the Chinese people was called unjustified and Tokio's bombing of "non-military cities, the maiming of thousands of women and children and destroying hospitals in unprotected zones," was assailed.

An alliance of labor and farmers and the liberal and progressive groups in the activity of Labor's Non-Partisan League was the subject of another of the 23 important resolutions adopted.

Joint Program

A program of joint action between organized labor and organized agriculture was announced during the month by Labor's Non-Partisan League. Terms of the compact between labor and farmers were arrived at in St. Paul, Minnesota, where representatives of the League and farm groups conferred.

A highlight of the agreement was the pledge of active cooperation on the political field. Mutual support of the legislative programs sponsored and approved by each group was agreed on.

Signers of the agreement for agriculture were the president and other officials of the Farmer's Educational and Cooperative Union of America and of the United Cannery, Agricultural, Packing and Allied Workers of America. These farm organizations are influential in a score of states between the Appalachians and the Rocky Mountains, covering the entire Mississippi Basin. The Farmer's Union is the third largest farm organization in the United States.

Included in the contract was a clause calling for a joint farmer-labor conference about January 15, 1938, for the purpose of drawing up a legislative program upon which farmers and labor can unite. Committees will then be set up for joint action at state and national capitals to forward the legislative program.

The text of the agreement states in part:

"Labor and farmers compose the great exploited mass of producers and consumers. We can establish our rightful position in society only through unity of action. We can preserve our right of the economic choice only by common action as opposed to those who seek to deprive us of our present liberties. We are opposed by the same groups. We are seeking the same social and economic objectives and we are committed to the same methods of achieving our common aims."

The agreement recognizes that labor and farmers can be kept subjected only by keeping them disunited, that their common opposition has heretofore succeeded by various methods in fostering antagonisms between them, thereby preventing united action, and aims at creating a better understanding between organized labor and the organized farmers.

Labor's League

Labor's Non-Partisan League has also been successful in uniting CIO and AF of L unions in New Jersey in a statewide labor party. The party was voted into existence at a Newark convention of delegates from 111 CIO and 34 AF of L unions and 29 other organizations. 150,000 workers were represented by the delegates.

"For the past 150 years the people of New Jersey have been ruthlessly exploited by corrupt political machines financed by Tory interests and maintained for their benefit," reads the resolution which created the party. "The time is here when the people are ready to throw off the chains of bondage and become free American citizens fighting for progress and against reaction."

New Jersey, home of Mayor-Director Hague of Jersey City, a wealthy, industial state, has long been the haven of runaway shops and is notorious for low wages and inadequate relief.

New Members

A further indication of the move for unity of all types of workers is the application of three arts unions for membership in the CIO.

Chet La More, secretary of the Artists Union of New York, an organization of approximately 1,000 members, has announced that his union, the Commercial Artists and Designers Union, and The Cartoonists Guild had agreed to ask for a joint membership through the United Office and Professional Workers of America.

The Cornerstone

(This column will present a monthly coverage of the building field.)

THE building slump which became apparent last October has grown to serious proportions. After a notable comeback early last year, private construction has receded to where it stood in the dark days of 1936. The home building field continues to shrink, having produced only about 250,000 family units in 1937 as compared with the predepression "normal" of 700,000 annually. Government housing activities fell off almost completely and it will be another six months before the new U. S. Housing Authority created under the Wagner-Steagall Bill can begin to produce results. And thanks to the Administration's determination to balance the budget, the expenditures for public works have been cut 20%.

The decline in public and private construction is reflected in increasing unemployment among the manual and technical workers in the building trades. The latest figures published by the American Federation of Labor show that in all trades the percentage of union members totally unemployed is 15%, and in the building trades 30%. In New York City the percentage of unemployed in the building trades in November, 1937, was 44%. Although no figures are available, there is every reason to believe that the slump in construction has thrown a considerable number of architects, engineers and other technicians out of work.

The obvious way to correct this deplorable condition is through increased construction. To begin with, the Administration must be induced to abandon its budget balancing policy and institute an enlarged public works program. The campaign of the reactionary big business interests for decreased government expenditures and lower taxes must be defeated. At the same time, the much-ballyhooed and long-overdue housing movement must be gotten under way. The recently-passed Wagner-Steagall Bill is entirely inadequate; it will provide necessary housing for only about 100,000 families in the whole country in three years. The real housing need is estimated by most authorities at about 1,000,000 new family units per year for the next ten years.

Auxiliary News

ANTICIPATING the action of the recent FAECT Organizational Conference and its decision to support the Japanese boycott, the New York Women's Auxiliary participated in an Anti-Silk Parade on December 11th, which created quite a stir in the silk stocking district of New York. Headed by a contingent of prominent screen and stage stars, Frances Farmer, Phoebe Brand, Katherine Warren, Hester Sondergaard and others, two thousand women from various women's organizations marched through the midtown streets of New York displaying lisle hose substitutes for the usually worn silk.

Heretofore we witnessed very little, if any, organized movement among women for their economic betterment. In the trade union movement generally, women were conspicuous by their small numbers. A changed picture exists today.

Aware of the steady rise of the cost of living, the New York Women's Auxiliary also sent delegates to a Conference held on December 11 and 12 at which 300 delegates from such organizations as the Parent & Teachers Association, Tenants Leagues, Mothers Clubs, Consumers Leagues, etc., conferred to discuss ways and means of curbing this increase.

Our auxiliaries have demonstrated their capacity to serve in the interests of technical men by involving their membership not only in campaigns of the Federation, but have also succeeded in involving them in campaigns equally necessary for mutual economic and social betterment.

For this reason, the Women's Auxiliaries urge all technical men not to lose sight of the valuable assistance that can be derived from a strong and well organized women's group whose purpose mainly is to build a broader base for Federation activities.

Legislative Department

FOLLOWING the decision of the Federation convention, a legislative department has been set up in Washington, with Brother Milton Fischer as National Legislative Representative.

The major functions of this department will be to draft legislation found necessary to fulfill our program, and to introduce and organize campaigns for such measures, to rally the support of our membership and other organizations as well as the general public; to prepare data and hearings for legislative measures; to participate in the enactment of all pro-labor, progressive legislation and against all anti-labor, reactionary measures.

At present the Federation legislative program revolves about increased Public Works as a long range plan, extension of the Wagner Housing Act with increased appropriations, patent legislation for the protection of employee-inventors, the Lundeen Bill for social security, the American Youth Act and the Wages and Hours Bill.

The legislative program relating to Federal Civil Service is based on 1—A 35-hour week with no pay decrease. 2—Upward revision of salaries set by the Reclassification Act with an $1,800 minimum for technical men. 3—Automatic salary increases within given grades. 4—Elimination of the present Efficiency Rating System in the Field Service. 5—Creation of a Federal Civil Service Appeals System to protect fully the rights of employees. 6—Liberalization and lowering of the retirement age limit. 7—Executive positions in the Service to be granted military or naval officers in civilian departments only on the same basis as civilians. 8—Strengthening the career system by extending Civil Service and increasing opportunity for promotion to a higher grade from a lower one.

The Federal 5-Day Week Bill, introduced by Representative McCormack, was sponsored by the FAECT.

A Bulletin is issued regularly by the Legislative Department which contains news of its legislative program and activities. Copies can be obtained by writing to Legislative Department, FAECT, 808 17th St. N.W., Washington, D. C.

Housing Study

ANALYTIC STUDY OF COST DIFFERENTIALS. *Housing Study Guild. New York.* $2.50.

IN 1934 the Housing Study Guild made an analytic study of the relative costs of residential buildings of varying numbers of stories, to see what technique such a study involved, and to determine what was the most economical height for the New York area at that time. A recent re-examination of the study shows that a very large portion of it is equally valid now, and useful in any architect's thinking and planning.

To enumerate a few of the significant points:

1. It includes both first cost and operation-maintenance costs. When the applicable interest rate, amortization rate, subsidy if any, are applied to these costs, the result appears in rent per room per month. This is, of course, the important figure that the consumer of housing is interested in. Too often cost analyses are confined to first cost only. The relative influence of first cost on rental varies with money rates. The study provides skeleton charts by which the rental results from different interest, amortization and tax rates can be calculated.

2. The study is based on various combinations of heating-hotwater-cooking-lighting, and throws light on how different methods of fuel, generation and distribution can be advantageously combined to reduce living costs. Indeed the proper solution of this group of related utilities results in surprisingly important differential savings, though generally they involve extra first cost. Of course, their advantages are largely lost in the individual house.

3. The study is based on actual plans and specifications, and actual contractors' bids taken on them. The typical floor plans and a summary of the specifications are given in charts. Costs are figured on the basis of quantities and unit prices. While no individual item of cost can ever be estimated quite accurately in the building industry, yet the differentials in cost will be accurate to a satisfactory degree for the purpose.

Utility costs outside the buildings themselves — called "Horizontal" costs in the study as distinguished from "Vertical" costs within the building—have been included in first cost.

4. The permanent value of the study consists in the complete and clearly presented *methods* employed. The framework, the procedure, the methods, are valid at any time, anywhere.

However, it must be understood that the analysis must be made freshly for each locality, for each type of construction, for a particular scale of wages and material prices. If for instance prefabricated wall sections and bathrooms were to result in great savings, then corresponding changes would have to be made in the cost figures, which might change the balance.

Also, much thought must be given to what plans are strictly comparable at different heights. In our studies it was felt that a different type plan with more apartments off one center core was legitimate in the taller buildings with elevator than in the lower walk-up buildings. For in the taller buildings, ground coverage and hence outlook are much improved over the necessarily greater coverage for the lower buildings.

Any architect or group can, of course, adopt plans, coverage and densities, materials and specifications suitable to local situations, within the framework provided by the study.

ALBERT MEYER

Sound Waves

SOUND WAVES: THEIR SHAPE AND SPEED. *Dayton Clarence Miller. Macmillan Co.* 164 *pp.* $2.75.

THIS book is an excellent example of a long series of extremely careful experiments in classical physics. It had its origin in the attempt by Professor Miller to investigate the tone quality of musical instruments objectively. The existing devices for recording sound waves were most unsuitable and hence he developed the "Phonodeik." This is an instrument somewhat similar to the old-fashioned type phonograph with a large horn for gathering the sound, a glass diaphragm and a most delicate mechanical and optical system for amplifying the motion of this diaphragm so that it may be photographically recorded or visually observed.

A rather complicated mathematical analysis was developed to correct the observations for inertia and resonance effects. With this instrument, Professor Miller made a painstaking series of investigations of the sounds of various musical instruments and of speech. This work has been previously described in his "The Science of Musical Sounds," published in 1916, and is presented as Part I of the present work. Electric Spark photography of rapidly moving objects is briefly discussed and interesting photographs of rifle bullets in motion and the accompanying air disturbances are shown.

The remainder of the book is a resume of the author's work at Sandy Hook during the war. A portion of this was done in conjunction with Dr. Hook of the Department of Physiology at Johns Hopkins, on the effects of sound waves following the firing of large guns. It was thought at the time that the pressure waves generated by the firing of large guns might be the cause of "shell shock." Special instruments were devised to measure this pressure which was found to rise to the phenomenal value of 542 lbs. per sq. in., twelve feet in front of a twelve inch rifle.

The shape of the sound waves was investigated with the "Phonodeik" and was found to consist of a rapid positive pressure pulse followed by a somewhat slower negative pressure pulse. This explains why windows fall outwards when a large gun is fired.

The cathode ray oscilloscope is not even mentioned although it gives an almost completely inertialess pointer without any resonance effects, and vacuum tube amplifiers are but briefly noted. For the general technical reader interested in the problem of sound waves, this book should be an interesting, if not particularly timely, account of a painstaking classical physicist at work.

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CIVIL SERVICE

Federal Division

THE 39 hour week has been restored to the 150 technicians working at the Portsmouth, New Hampshire, Yard. A serious threat to all the Navy Yard technicians has thus been averted by the prompt action of the Federation. When the men were put on the 44 hour schedule a month ago the Federation protested to Assistant Secretary of the Navy, Edison. The Navy Department claimed work was behind schedule. The Federation asked that more men be hired. Going even further, it organized a protest of the technical men at Portsmouth who had set up a committee to cooperate. A petition signed by the men asking that the 39 hour week be restored was sent to Edison. The result was immediate. The men were restored to their former schedule on December 6 and more men have been given jobs.

Marine Draftsmen

Chapter 24 continues to grow rapidly. Former members of Local 10 of the International Federation of Technical Engineers, Architects and Draftsmens Union are now enrolling in our Chapter in the Brooklyn Navy Yard. Material to be presented to the Congressional Federal Civil Service Committees hearings next month on the Federal Civil Service Minimum Wage Bill has been compiled. The Chapter has been very active on cases of discrimination in the Yard. Noel Webster, President of this Chapter, is the choice of both the Washington Chapter and the Brooklyn Navy Yard as delegate to the National Executive Council of the FAECT.

Philadelphia Navy Yard

After a meeting attended by Philip Salaf, and Milton Fischer of the FAECT and John Fogelman, President of the Joint Council of Navy Yards of the International Union of Marine and Shipyard Workers an agreement was reached whereby both CIO unions would cooperate in the organization of the Philadelphia Yard. It was planned to start an intensive drive in this yard January 1st to organize the 5,000 technical men here.

Washington Chapter

Washington has accepted the challenge of the men at the Brooklyn Yard. According to President John Vasta a series of organizational meetings have been held at the Navy Yard, at the Navy Department and the Bureau of Standards. New members have been signed up in Metallurgical Testing at the Yard and C and R at the Navy Department. Local reports more than a third of the total potential membership signed up in the space of two weeks. Petitions for the five day week are being circulated. At Procurement a petition for better conditions in the cafeteria was circulated by Federation members, and 400 technical men signed. A letter protesting the union-baiting activities of supervisors in this department was sent to Secretary Morgenthau. A definite statement of policy toward unions was requested.

Federal Legislation

The Federation through its Legislative representative, Milton Fischer, in cooperation with President Jacob Baker of the United Federal Workers of America and John Fogelman of the IUM SWA initiated a conference on legislation for Federal Civil. The CIO Unions interested in this type of legislation, the FAECT, the UFWA and the Marine and Shipbuilding Workers, met December 28. At this conference which will be more fully reported in our next issue, an effective campaign for the enactment of Federal Legislation for the benefit of Federal Employees was mapped out.

Legislative Department

The Bulletin of the Legislative Department was distributed this last month and carried analyses of bills affecting technical men as well as the activities of the Department. Particular emphasis was placed upon the passage of the Wage and Hour Bill. One hundred Congressmen received letters asking support of the bill, letters were sent to all Chapters asking them to send telegrams in support of this piece of legislation. Brother Fischer met with officials of the U. S. Housing Authority and presented the Federation scale of wages as the proper standard to be set for technical men engaged on housing work. He also met with Mary Gion of the UMWA to decide on standards for men engaged in the Ammunition, Explosives and Firearms Industry. The Federation has been requested to present rates to be paid technical men in this industry according to the provisions of the Walsh-Healy Act.

State and Municipal

ON December 4, employees of the Bureau of Construction and Maintenance filled the large cafeteria located on the first floor of the Bureau, to be addressed by Messrs. James Marshall, Commissioner of the Board of Education, Walter C. Martin, Architect of the Bureau, and A. Judwin, Chairman of the New York Civil Service Chapter of the FAECT.

Mr. Marshall's remarks in favor of the merit system (the enforcement of which is on the "must list" of the FAECT program) and Mr. Martin's stress of the importance of the work of the Bureau, were greeted with prolonged applause.

Mr. Martin thanked the Council for having invited Mr. Marshall to the meeting.

Mr. A. L. Judwin, president of Chapter 23, in a brief talk, explained the need of organization into the FAECT. A lively discussion from the floor on the question of reclassification was the last item on the agenda of this first of a series of educational meetings scheduled by the Board of Education Council.

During the past weeks, numerous protests had been received by Chapter 23 against overtime work in the Tunnel Authority. The Chapter took the matter up in a communication by Secretary Harold Fink, addressed to Ole Singstad on November 30th. As a result, overtime was discontinued on December 1st.

Borough President of Manhattan, Stanley M. Isaacs, elected on a Labor-Fusion ticket has expressed approval of organization for civil service employees. In a statement to New York Chapter 23, he said: "I believe Civil Service employees should organize if they care to in such organizations as they may choose, such organizations to function in any proper way to promote the security and welfare of the employees."

The People's Congress

THE rise of vigilante groups throughout the country, the attacks in disguised fascist form, on trade unions, including our own, and the need for backing the President's proposals for the preservation of peace, are the vital and pressing problems affecting everyone. In Europe and Asia aggressive wars are going on.

In that setting the Peoples Congress for Peace and Democracy convened in Pittsburgh, Pa., November 26-28. 1,416 delegates attended, representing more than 4 million people. 413 labor delegates, from AFL and CIO unions, representing 1,622,231 trade unionists, were at the session.

The fundamental purpose of the American League, to institute and organize united action of all those desiring to develop democracy and to end war, is best illustrated in its program for 1938:

Organize emergency citizens' committees for labor's rights wherever those rights are attacked either by employers or by public officials.

Defeat legislative attempts to compel incorporation of unions and to control or inspect union finances by governmental or other outside agencies.

Press for an anti-lynching law and measures to guarantee full rights for the Negro people and the foreign born.

Oppose vigorously the propaganda of race prejudice and discrimination.

Defeat the War Department plan to conscript labor and industry and to regiment press and radio.

Support the nationalization of the manufacture of arms, munitions and implements of war, forbidding export except when ordered by Congress in cases of countries invaded by an aggressor.

Promote the people's boycott of Japanese goods.

Seek to remove and prevent restrictions on the access of the governments of China and Spain to our markets, applying regulations to purchases and shipments designed to remove the risk of our becoming involved in war.

Work for a foreign policy based on:

The distinction between the aggressors and their victims.

The necessity of concerted action to quarantine aggressors.

Streamlined Railroads

(*Continued from Page 3*)

for Budd is a company union plant throughout.

As may be expected, the drafting rooms fare no better than the shop. 80c per hour is looked upon as a high rate for a draftsman on stream lined cars, and it's a big day in their lives, when their "representative" has the time clock moved to a more advantageous column, or a new plug placed in their wash bowls. In the meantime, the train is attracting plenty of attention. All seats are reserved, and cars are crowded each day on the two runs to New York. If it can ever be made to hop over the Hudson river, the Reading will have solved all its problems. It is doubtful if the train will ever equal the speed records of 100 or more m.p.h. established by old steam locos of bygone days; at least, until stronger roadbeds and bridges are built; but it will probably be a profitable novelty for the Reading Co., for years to come.

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